

What is claimed :

- 1 1. A torque-transmitting assembly comprising:
  - 2 a) a female coupling member with a bore;
  - 3 b) a radially flexible member, received within the bore, defining a hollow shape with an
  - 4 opening; and
  - 5 c) an elongated shaft member made of a super-elastic alloy, received within the opening,
- 6               whereupon relative motion among at least two of the members causes the radially
- 7 flexible member to contact the shaft, inducing a super-elastic activation in the shaft that
- 8 urges the shaft and radially flexible member into surface-to-surface contact, securing the
- 9 members together in a fixed relative position.
- 1 2. The assembly of Claim 1 wherein the radially flexible member has an external surface
- 2 that frictionally engages the bore upon relative motion.
- 1 3. The assembly of Claim 1 wherein the shaft is tubular with a cannulation.
- 1 4. The assembly of Claim 3 wherein the bore of the female coupling member further
- 2 comprises a cannulation aligned with the shaft cannulation, for common passage of a
- 3 guide wire there through.
- 1 5. The assembly of Claim 1 further comprising an inter-positional polymer sleeve for
- 2 transmitting bending stress in the assembly.
- 1 6. The assembly of Claim 1 wherein the contact occurs in one or more areas that
- 2 frictionally carries the applied torque.

- 1    7. The assembly of Claim 6 wherein the contact area is calibrated so that the contact slips  
2 at a preset torque before the failure strength of the shaft is reached.
- 1    8. The assembly of Claim 1 wherein the female coupling member further comprises a  
2 counter-bore and the radially flexible member has an exterior surface adapted for  
3 engagement within the counter-bore.
- 1    9. The assembly of Claim 8 wherein the radially flexible member is compressed within  
2 the counter-bore.
- 1    10. The assembly of Claim 1 wherein the female coupling member is a fitting that  
2 connects the assembly to a cutting tool-bit or powered instrument.
- 1    11. The assembly of Claim 1 wherein the female coupling member further comprises a  
2 fitting with a cutting tool-bit.
- 1    12. The assembly of Claim 11 wherein the assembly is further connected to a powered  
2 instrument.
- 1    13. The assembly of Claim 1 wherein the radially flexible member is a split collet.
- 1    14. The assembly of Claim 1, the radially flexible member being in the form of a collar  
2 and made of super-elastic alloy, wherein the relative motion further induces a super-  
3 elastic activation of the collar.
- 1    15. The assembly of Claim 1 wherein the collar further comprises a washer.
- 1    16. The assembly of Claim 15 wherein the collar further comprises a series of washers.
- 1    17. The assembly of Claim 14 wherein the super-elastic alloy is a nickel-titanium alloy.
- 1    18. A torque-transmitting coupling assembly comprising:

2       a) a split collet member having an exterior surface and an opening;  
3       b) an elongated shaft member made of a super-elastic alloy, received within the opening;  
4       and  
5       c) a sleeve member having a bore that receives the exterior surface of the collet,  
6       whereupon relative motion among at least two of the members causes the opening to  
7       contact the shaft, inducing a super-elastic activation in the shaft that urges the shaft and  
8       the collet into surface-to-surface contact, securing the members together in a fixed  
9       relative position.

- 1       19. The assembly of Claim 18 wherein interfering engagement of the exterior surface  
2       with the bore compresses the opening against the shaft, inducing the super-elastic  
3       activation in the shaft.
- 1       20. The assembly of Claim 18 wherein the shaft is tubular with a cannulation.
- 1       21. The assembly of Claim 20 wherein either the sleeve or collet has a cannulation  
2       aligned with the shaft cannulation, for common passage of a guide wire there through.
- 1       22. The assembly of Claim 18 further comprising an inter-positional polymer sleeve for  
2       transmitting bending stress in the assembly.
- 1       23. The assembly of Claim 18 wherein the surface-to-surface engagement occurs along  
2       one or more contact areas that frictionally carries the applied torque.
- 1       24. The assembly of Claim 23 wherein the contact area is calibrated to slip at a preset  
2       torque before the failure strength of the shaft is reached.
- 1       25. The assembly of Claim 18 wherein the collet is connected to a cutting tool-bit or  
2       powered instrument.

- 1        26. The assembly of Claim 18 wherein the collet further comprises a cutting tool-bit.
- 1        27. The assembly of Claim 26 further coupled to a powered instrument.
- 1        28. A torque-transmitting coupling assembly comprising:
- 2        a) a fitting member formed with a counter-bore;
- 3        b) a collar member made of super-elastic alloy, having an exterior surface and an
- 4        opening, the collar being located in the counter-bore; and
- 5        c) an elongated shaft member made of a super-elastic alloy, received within the opening;

6              whereupon relative motion between the fitting and the collar causes the collar to  
7        contact the shaft, inducing a super-elastic activation in the shaft that engages the shaft  
8        and collar into surface-to-surface contact, securing the members together in a fixed  
9        relative position.

- 1        29. The assembly of Claim 28 wherein engagement of the exterior surface with the  
2        counter-bore super-elastically compresses the opening against the shaft.
- 1        30. The assembly of Claim 29 wherein the collar further comprises a washer.
- 1        31. The assembly of Claim 30 further comprising a series of washers.
- 1        32. The assembly of Claim 28 wherein the super-elastic alloy is a nickel-titanium alloy.
- 1        33. The assembly of Claim 28 wherein the shaft is tubular with a cannulation.
- 1        34. The assembly of Claim 33 wherein the fitting has a cannulation aligned with the  
2        shaft cannulation, for common passage of a guide wire there through.

- 1    35. The assembly of Claim 28 further comprising an inter-positional polymer sleeve for  
2    transmitting bending stress in the assembly.
- 1    36. The assembly of Claim 29 wherein the frictional engagement occurs along one or  
2    more contact areas that frictionally carries the applied torque.
- 1    37. The assembly of Claim 36 wherein the contact area is calibrated so that the coupling  
2    slips at a preset torque before the fatigue strength of the shaft is reached.
- 1    38. The assembly of Claim 28 wherein the fitting is connected to a cutting tool-bit or  
2    powered instrument.
- 1    39. The assembly of Claim 28 wherein the fitting further comprises a cutting tool-bit.
- 1    40. The assembly of Claim 39 further coupled to a powered instrument.
- 1    41. A method of forming a torque-transmitting assembly, comprising the steps of:
- 2    a) providing a female coupling member with a bore;
- 3    b) providing a radially flexible member with an external surface and an opening, situating  
4    the radially flexible member within the bore
- 5    c) providing an elongated shaft member made of a super-elastic alloy, received within the  
6    opening; and
- 7    d) relatively moving at least two of the members, causing the radially flexible member to  
8    contact the shaft, inducing a super-elastic activation in the shaft that urges the shaft and  
9    radially flexible member into surface-to-surface contact, securing the members together  
10   in a fixed relative position.

- 1    42. The method of Claim 41 wherein step d) further comprises frictionally engaging the  
2    members along a contact area that carries the applied torque, the contact area being  
3    calibrated to slip at a preset torque before the failure strength of the shaft is reached.
- 1    43. The method of Claim 42 further comprising the steps of providing the female  
2    coupling member with a counter-bore, providing the radially flexible member in the form  
3    of a collar made of super-elastic alloy and inducing a super-elastic activation in the  
4    collar.
- 1    44. The method of Claim 42 wherein step a) further comprises providing a radially  
2    flexible member in the form of a split collet.
- 1    45. A flexible surgical reamer having a torque-transmitting assembly and comprising:  
2       a) a fitting member formed with a counter-bore and including a cutting tool-bit;  
3       b) a collar member made of super-elastic alloy, located in the counter-bore; and  
4       c) an elongated shaft member made of a super-elastic alloy, adapted for receipt within the  
5    collar;  
6              whereupon relative motion among the members causes the opening to contact the  
7    shaft, inducing a super-elastic activation in the shaft that urges the shaft and the collar  
8    into surface-to-surface contact, securing the members together in a fixed relative position.
- 1    46. The reamer of Claim 45 wherein the collar is an annular member.
- 1    47. The reamer of Claim 46 wherein the collar further comprises a washer.
- 1    48. The reamer of Claim 47 wherein the collar further comprises a series of washers.
- 1    49. The reamer of Claim 48 wherein the collar is pre-assembled with the fitting.

- 1    50. The reamer of Claim 45 further comprising an inter-positional polymer sleeve for  
2    transmitting bending stress in the assembly.
- 1    51. The reamer of Claim 45 wherein the contact occurs along an area that frictionally  
2    carries the applied torque.
- 1    52. The reamer of Claim 51 wherein the contact area is calibrated to slip at a preset  
2    torque before the failure strength of the shaft is reached.
- 1    53. The reamer of Claim 45 wherein the shaft is tubular, with a cannulation.
- 1    54. The reamer of Claim 53 wherein the fitting has a cannulation that aligns with the  
2    shaft cannulation for passage of a guide wire through the reamer.
- 1    55. A flexible surgical reamer having a torque-transmitting assembly and comprising:  
2       a) a radially flexible member having a split collet with an exterior surface and an  
3       opening, and including a cutting tool-bit;  
4       b) an elongated shaft member made of a super-elastic alloy, received within the opening;  
5       and  
6       c) a sleeve having a bore that receives the exterior surface,  
7       whereupon relative motion among the members causes the opening to contact the shaft,  
8       inducing a super-elastic activation in the shaft that urges the shaft and the collet into  
9       surface-to-surface contact, securing the members together in a fixed relative position.
- 1    56. The reamer of Claim 55 wherein the exterior surface is compressed by the bore,  
2       further contracting the opening against the shaft to induce the super-elastic activation.
- 1    57. The reamer of Claim 55 wherein the shaft is tubular with a cannulation for passage of  
2       a guide wire there through.

- 1    58. The reamer of Claim 56 wherein the opening interferingly receives the shaft and is  
2    expanded to compress the exterior surface against the bore.
- 1    59. The reamer of Claim 55 further comprising an inter-positional polymer sleeve for  
2    transmitting bending stress in the assembly.
- 1    60. The reamer of Claim 55 wherein the contact occurs along an area that frictionally  
2    carries the applied torque.
- 1    61. The reamer of Claim 60 wherein the contact area is calibrated to slip at a preset  
2    torque before the failure strength of the shaft is reached.
- 1    62. The reamer of Claim 61 wherein the shaft is further connected to a powered  
2    instrument.

3